



## PSEUDOTUMOR CEREBRI – BENIGN CONDITION MAY INCREASE RISK OF BRAIN TUMOR DUE TO INJUDICIOUS USE OF BRAIN RADIO IMAGING

Dr. Subir Pal<sup>1</sup>, Dr. Saptarshi Banerjee<sup>2</sup>, Jayashree Pal<sup>3</sup>

<sup>1</sup> MBBS, DCH, MD, Consultant Child Specialist, Visiting Consultant Manipal Hospital (Mukundapur), Iris Hospital (Kolkata), Apex Institute of Medical Science (Kolkata)

<sup>2</sup> MBBS, MD, Assistant Professor, Medical College Hospital, Kolkata

<sup>3</sup> B. TECH, Social Worker

### ABSTRACT

Pseudotumor Cerebri (PTC) is a condition of elevated Intracranial pressure in the absence of Intracranial space occupying lesion that can occur in average group including pediatric population. The review discuss the diagnosis of PTC by history, clinical examination without or minimal use of neuro imaging by Computed Tomography (CT) Scan as the concern of Radiation Exposure. CT Scan may increase the risk of Future Development of Brain Tumor and other malignancy.

**Aim of Study:** Radiation is one known important risk factor for the Brain Tumor and other malignancy. Minimal use of Radiation to Developing Brain will reduce the risk of future development of malignancy.

**KEYWORDS:** Pediatric Population, Pseudotumor Cerebri, Brain Tumor, Vitamin A Intoxication

**Pseudotumor Cerebri:** PCT or Idiopathic Intracranial Hypertension (IIH) is a disorder of elevated Intracranial Pressure (ICP) without any evidence of infection, vascular abnormality, space occupying lesion, hydrocephalus or alteration of consciousness [1].

**Etiology:** In Pediatric Population there is an identifiable cause [2]. Reported associated causes are

1. Endocrine abnormalities.
2. Medication(Tetracycline,Nitrofurantoin,Chemotherapy drug).
3. Viral Infection (Varicella, Measles).
4. Nutrition (Vitamin A toxicity, Vitamin A or D deficiency, Obesity or recent substantial weight gain).
5. Systemic condition (Acute lymphocytic leukemia, Turner syndrome).

Clinical manifestation of PTC in Pediatric age group: Bulging Fontanel, Irritability associated with vomiting in infant may be the initial symptom. In young children irritability hyporeactivity, Anorexia, Sleep disruption head tilting and papilledema are the non specific symptoms which are present with Benign Increase Intracranial tension. Cushing's triad are sets of signs that are present with increase Intracranial pressure and consists of 1-Bradycardia, 2-Irregular Respiration and, 3-Widen Pulse pressure.

**Diagnosis of PTC:** We Doctor being human being the old trust strategy for diagnosis a disease or health related condition our important three pillars are – 1.History, 2.Clinical Examination, 3.investigation. If we take proper history and clinical examination, we can cut cost of therapy doing

investigation and also can avoid side effect of investigation like Radiation Hazard, cross infection etc. It also true with our present discussion . Diagnostic test for PTC are 1.Brain Imaging as MRI or CT SCAN, 2.Lmber Puncture: to confirm the elevated pressure(>25cm) , CSF study to exclude infection and inflammation, 3.Ophthalmoscopic examination: will show papilledema 4.Neurological Examination: Normal other than cranial nerve abnormalities.

**Brain Tumor in Pediatric Patient and risk factor of Brain Tumor:** Brain Neoplasm maybe primary or secondary to metastasis . It is one most common primary Neoplasm in childhood second to leukemia in over all incidence. Age adjusted incidence rate 5-4 cases/100000 children/year. Peak incidence is seen in <7 year age. Brain Neoplasm is the most common cancer death in children.

**Etiology and Risk factor:** No specific agents are known but Ionizing Radiation to the head may increase the chance of primary brain tumor. About 5% primary brain tumor are linked to a few inherited disease such as Neurofibromatosis, Tuberous sclerosis, Multiple Endocrine Neoplasm type-1 and retinoblastoma [3].

**Diagnosis and work up:** Again we believe history and clinical examination are important part before diagnostic work up. In case of brain tumor headache and vomiting particularly in the morning, difficulty in swallowing, slurred speech, diplopia, visual field defect, weakness, ataxia and change in Cognitive Function may be present.

1. Routine Laboratory Studies – CBC, Coagulation profile, Electrolyte and metabolic panel.

2. Computed Tomography (CT) – is the Imaging Modality of choice in emergency department.
3. Magnetic Resonance Imaging (MRI) – may supplant CT. Post operative brain MRI within 24 to 48 hours helpful to determine residual disease [4].

**CT scan and Brain Tumor:** The risk of Brain Tumor may increase with CT scan commonly used in Medical Imaging [5,6]. Children are more susceptible to radiation induce cancer than adult and it is seen that the life time attributable risk of malignancy from a single head CT may be more than tenfold for and infant and adult [7]. The CT scan most commonly used in medical imaging in children might increase the risk of Leukemia and Brain Tumor. The cumulative dose of 60mGy triple the risk of Brain Cancer. CT scan ought to be kept as low as possible and alternative non Ionizing Radiation procedure may be used if appropriate [8]. The relative risk of Brain Tumor (RR) increased by 0.023 for each miligray (mGy) of radiation [9]. Pediatric head CT scan is associated with 2.97 fold higher incidence of benign Brain Tumor. The frequency of CT examination strongly correlated with the subsequent risk of malignancy [10].

**Excess vitamin A may cause PTC:** Vitamin A is a fat soluble vitamin (Retinol), need for immunity, growth, visual and dermatological health. In our life in every aspect we need to maintain balance, it is true also with vitamin A. In excess amount can cause toxicity. It may be acute toxicity or chronic. Normal healthy children having no nutritional deficiency that is no vitamin deficiency, if given prophylactic dose of vitamin A may be a excess for that individual leading to sign and symptom of hyper vitaminosis A. Proper history, clinical suspicion and clinical examination may be enough to diagnosis the condition. We found three cases of hyper vitaminosis A. All are from well to do family of around 9th month age with history of ingestion of 200000 IU vitamin A followed by excessive uncontrolled vomiting, irritability, increase cry. Clinical examination revealed bulge anterior fontanel (fig-1) and child is restless. There is no history of blunt trauma head, no mark of external injury noted and no any clinical finding observed suggestive of inherited disease like neurofibromatosis (cafe au lait spots – flat, light brown spot on skin, freckling in the arm pits or groin area) [11], tuberous sclerosis ( ash leaf spots – hypomelanic macules, facial angiofibroma or adenoma sebaceum – reddish spot on the face, forehead plaque – raised discoloured area, shagreen patches – thick leathery, pebbly skin on lower back or nape of the neck. Ungual or subungual fibroma – small fleshy tumor growth under toe or fingernail) [12]. It is obvious from history and clinical examination that the cause of increase Intracranial tension is vitamin A excess then we can avoid radiation exposure to growing brain and can protect the brain from development of Brain Tumor.

<p><b>1. Definition:</b> The growth of abnormal cells in the tissue of the brain.</p> <p><b>2. History:</b> Chief Complaints: headache &amp; vomiting (morning time). Difficulty in swallowing, slurred speech, Diplopia, visual field defect, focal weakness, changing behavior, polyuria, failure to thrive.</p> <p>Physical Examination: Papilledema, Focal neurological deficit, sign of neuro cutaneous disease, impaired upgaze, nystagmus, poor pupillary light response.</p> <p><b>3. Age:</b> Peak incidence &lt;7 year age.</p> <p><b>4. Sex:</b> Male predominance.</p> <p><b>5. Diagnosis:</b> Proper History, clinical examination and investigation guide the Diagnosis. Morning Headache, papilledema, focal neuro deficit decrease visual acuity, sign of neuro cutaneous disease.</p> <p>MRI Brain, CT Brain, CSF Cytology.</p>	<p><b>1. Definition:</b> Pseudo Tumor Cerebri also known as Idiopathic intracranial hypertension causes symptoms of elevated pressure in the head as seen with Brain Tumor but have normal brain, the condition has been called Pseudo Tumor Cerebri or False Brain Tumor.</p> <p><b>2. History:</b> Chief complaints: headache &amp; vomiting (mainly acute onset not morning time). Blurred vision, stiffness, irritability, somnolence, history of ingestion of high dose vitamin A, may not be focal weakness, usually not associated with failure to thrive.</p> <p>Physical Examination: Papilledema, bulge anterior fontanel.</p> <p><b>3. Age:</b> As young as 4 months, vitamin A excess around 9<sup>th</sup> month age particularly.</p> <p><b>4. Sex:</b> Boys and Girls equal in childhood.</p> <p><b>5. Diagnosis:</b> Proper History, Physical Examination and history of ingestion of high dose of vitamin A. No focal neuro deficit, irritable, bulge anterior fontanel (fig-1). Clinical Diagnosis important particularly avoid brain imaging to protect the growing brain from future development of Brain Tumor.</p>
--	--

Table 1



FIG – 1 Bulge anterior fontanel.

#### Treatment of Brain Tumor:

**Surgery:** Maximum Debulking and histological / molecular characterization.

**Radiation:** Targeted Proton Beams, Stereotactic Radiosurgery.

**Chemo Therapy:** Medicines that attack specific chemicals

within the Tumor Cells.

**Other:** Symptomatic Treatment, Physical Therapy, Speech Therapy, Tutoring.

**Treatment of PTC due to Vitamin A excess:**

Stop Further Exposure of Vitamin A.

**Acetazolamide:** 25 to 100 mg/kg/day in 2 to 4 divided doses.  
Second line drug Furosemide if Acetazolamide ineffective.

**Other Symptomatic Treatment.**

**Conclusion**

Modern Era is the evidence based medicine and it is due to advancement of knowledge and science. Considering cost of therapy and the notorious future side effect of investigation, we feel the importance of clinics – was there, is now and will be there. From history and clinical examination when vitamin A excess is the cause of PTC, Brain imaging may be avoided to protect the infant from future development of Brain Tumor and other Radiation induced malignancy.

**REFERENCES**

1. Friedman DI, Jacobson DM, Diagnostic criteria for idiopathic intracranial hypertension, Neurology November 26, 2002 issue; 59(10) 1492-1495; <https://doi.org/10.1212/01.WNL.0000029570.69134.1B>
2. I.U Scott, R.M Siatkowski et al. Idiopathic intracranial hypertension in children and adolescents. AM J Ophthalmol 1997;124:253-255; DOI:10.1016/S0002-9394(14)70798-6
3. The 5 Minute Pediatric Consult, 8th ed. Page 122.
4. Timing of Early Postoperative MRI following Surgery-A Retrospective Study of Contrast Enhancements in 311 Patients. Alexander Malcolm Rykkje et al. 2023 Feb 20;13(4):795. doi:10.3390/diagnostics 13040795
5. CT scan may increase risk of brain cancer. Oxford Universities Press USA, July 19, 2018; DOI:10.1093/jnci/djy104
6. Meulepas JM, Ronckers CM et al. Radiation Exposure From Pediatric CT Scans and Subsequent Cancer Risk in the Netherlands. JNCI, volume 111, issue 3, March 2019, Pages 256-263, <https://doi.org/10.1093/jnci/djy104>
7. John P. Sheppard, Joel Stanley Beckett et al. Risk of Brain Tumor Induction from Pediatric Head CT Procedures: A systematic Literature Review. April 27, 2018, 6(1):1-7. DOI:10.14791/brrt.2018.6.e4
8. Mark S Pearce, Jane A Salotti et al. Radiation exposure from CT Scan in childhood and subsequent risk of leukemia and brain tumor: a retrospective cohort study. Aug 4, 2012;